

## FRACTURE OF THE OS MAGNUM.

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THE older writers believed, and the statement is still maintained in many standard text books on surgery, that fractures of the carpal bones are very uncommon, and when they do occur are usually compound, comminuted or multiple.<sup>1</sup> That this statement is not in conformity with facts, as brought out by X-ray examination, is demonstrated by the increasing number of published case reports of isolated fractures of carpal bones, more particularly the scaphoid and semilunar. Among twenty cases of fracture of carpal bones which came under treatment in the Cologne City Hospital service of Prof. Bardenheuer, from 1901-6, only one concerned the os magnum.<sup>2</sup> The relative rarity of fracture of the largest carpal bone adds more than common interest to the following observation, which is reported with the object of calling attention to this hitherto neglected variety of fracture, and of stimulating surgical scrutiny in relation to so-called sprains of the wrist joint.

CASE.—Male, single, age 33. On August 16, 1908, while cranking an automobile, his hand slipped and the heads of the second and third metacarpal bones of the right hand struck with considerable force the spring, causing forcible flexion at the wrist joint. He was seen for the first time in the Surgical Department of Vanderbilt Clinic, No. 44,454, on August 18, 1908. He complained of severe pain and swelling of the wrist. The examination was made by Dr. Alfred C. Prentice. It was found that the right wrist joint was swollen and hot. Tenderness was diffuse over the carpus and motion was markedly limited. Acute pain was produced by manipulation. An X-ray examination revealed a transverse fracture of the neck of the os magnum. Wet dressings and an anterior splint were applied for three days, when the splint was discarded and the wrist joint strapped. On September

1, 1908, the adhesive was removed and the patient discharged, as he wished to resume his work as a chauffeur.

He was seen for the last time on October 7, 1908. He complained then of an inability to use the hand in efforts requiring strength. For example, he could not "crank" an automobile. Flexion and extension were limited, particularly the latter movement and marked tenderness was obtained by direct pressure over the bone. Distinct bone crepitus was elicited by manipulation of the hand, the palpating fingers being placed over the dorsal and palmar surfaces of the bone.

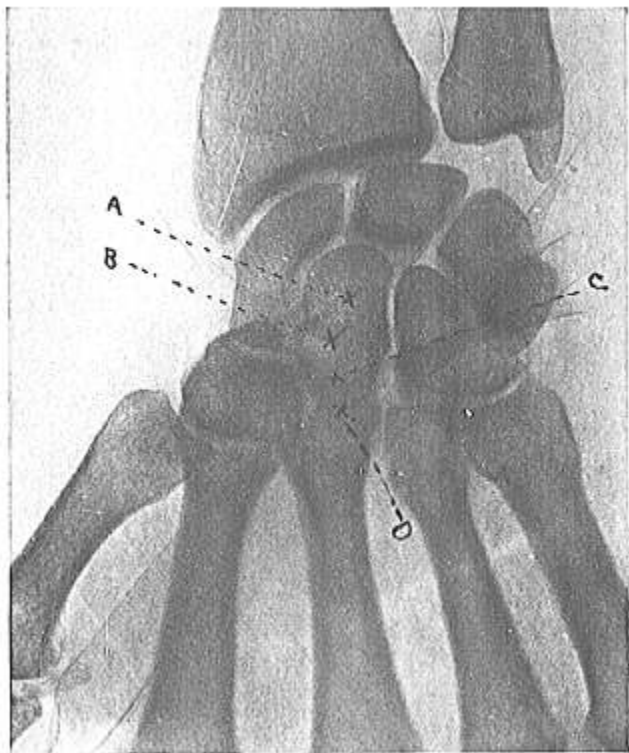
This outcome must not be regarded as especially unfortunate, since this small fracture, upon the basis of the anatomical relations, has been classed as one of the most serious and difficult to treat among fractures of the radiocarpal region. Moty<sup>3</sup> holds that in traumatism of this character, more or less well-marked ankylosis of the two great articulations of the wrist joint must be considered as the natural termination.

A careful and thorough search of the literature reveals but five authentic reported cases, in four of which the diagnosis was based on the clinical signs and symptoms, and in one case only (that of Guermontprez-Monjaret<sup>4</sup>) was radiographic examination employed.

Before discussing these five authentic cases of fracture of the os magnum, reference should be made to several cases described in the literature in which the diagnosis was doubtful, or in which the fracture was associated with multiple fractures of other carpal bones.

The case of Robert,<sup>5</sup> which is not accessible in the original, is quoted as doubtful by Le Dentu and Delbet.<sup>6</sup> Duplay and Reclus<sup>7</sup> refer to the case of a physician who sustained an injury to the wrist which was treated as a sprain. As a limitation of motion at the wrist joint persisted, the patient endeavored to determine the accuracy of the diagnosis by means of the X-ray; the radiograph showed a fracture of the scaphoid, trapezium, trapezoid and os magnum, and that these bones had become welded into one mass by exuberant callus.

FIG. 1.



Radiography. A. Upper fragment. B. Line of fracture. C. Lower fragment. D. Obliteration of normal joint line.

In a case reported by Guibout, quoted by Auvray,<sup>8</sup> the os magnum was fractured at the same time as the scaphoid, pyramidal, and pisiform bone. Natrig<sup>9</sup> reports a case in which the radiograph showed two fractures of the scaphoid, with detachment of the left lower corner of the os magnum.

Destot,<sup>10</sup> in a paper reporting a large number of cases of fracture of the scaphoid, mid-carpal luxations, and fracture of the cuneiform, mentions three cases of fracture of the os magnum, without giving clinical histories and diagnostic criteria. Brigel at the 78th Meeting of German Naturforscher und Aerzte, 1906, mentioned two cases of fracture of the os magnum which came under observation in St. Katherine's Hospital, Stuttgart. Stimson<sup>11</sup> describes a case "in which the possibility of fracture was suggested by pain on pressure over the neck of the bone."

The authentic cases arranged in chronological order are as follows:

GUERMONPRÉ.<sup>12</sup>—This case, a fracture of the neck of the os magnum, was associated with an extensive synovitis of the flexor tendons, which the author believed was caused by the fragments piercing the synovial sheaths. Immobilization of the wrist was followed by recovery, but a slight increase in the anteroposterior diameter of the wrist joint remained.

BALTUS.<sup>13</sup>—This observer, whose case may be included on the authority of Delbecq, reported a fracture of the os magnum, in which the injury occurred in connection with a sudden violent twisting of the wrist joint.

BARDENHEUER.<sup>14</sup>—The patient was a laborer, sixty years of age, who fell from a scaffold, striking the ulnar side of the dorsum of the hand, and the heads of the third and fourth metacarpal bones. The diagnosis was based upon the exquisite tenderness and subsequent dorsal displacement of the head of the bone.

MORY (*l. c.*).—The patient, a cavalry soldier, was thrown from his horse, striking the dorsal surface of the left hand. When examined soon after the accident, a hard bony protuberance, round and smooth, was found, evidently formed by the radiocarpal articular surface of the carpal bone. This dislocation was easily reduced, and the forearm and wrist were immobilized. When examined on the second day, a large swelling was noted on the back of the hand and severe pain elicited over the lateral ligaments of the wrist joint. Crepitus was not obtained, and the styloid processes maintained their normal relationship. This dorsal swelling persisted and at the end of two weeks was still painful and tender; at that time distinct crepitus could be obtained by direct pressure.

GUERMONTREZ-MONJARET (*l. c.*).—The patient was a workman whose right hand was caught under a heavy millstone. The most evident symptom was great flattening of the hand and wrist which was followed in two days by a large swelling. The soft parts were intact and no crepitus could be obtained. The hand was immobilized for a few days, followed by massage, and exercises were recommended. Six months after the accident, there was swelling of the wrist, obliteration of the normal anatomical configuration, and muscular atrophy of the forearm and hand. A radiograph taken at that time showed a longitudinal fracture of the os magnum.

In studying the mechanism of this fracture, it is apparent that the injury may be caused either by direct violence over the bone, or indirectly by violence applied to the head of the second, third or fourth metacarpal bone, sufficiently severe to produce forcible flexion at the wrist joint. It is interesting in this connection to note that Auvray (*loc. cit.*) succeeded in producing experimental fractures of the carpal bones through direct or indirect violence, the latter being usually accompanied by lesions of the lower extremity of the radius.

In order to explain the manner by which forcible flexion at the wrist joint produces a fracture of the neck of the os magnum, it is necessary to describe the function of the mid-carpal joint as determined by the anatomical peculiarities of that joint. According to Gray,<sup>15</sup> "the chief movements permitted in the transverse or mid-carpal joint are flexion and extension and a slight amount of rotation. In flexion and extension, which are the movements most freely enjoyed, the trapezium and the trapezoid on the radial side and the unciform on the ulnar side glide forward and backward on the scaphoid and cuneiform respectively, while the head of the os magnum and the superior surface of the unciform rotate in the cup-shaped cavity of the scaphoid and semilunar. Flexion at this joint is freer than extension."

Bearing in mind the "rotating" function of the head of the os magnum, it is readily understood that a force acting on the heads of the second, third or fourth metacarpal bones and producing forcible flexion at the wrist joint, is transmitted primarily to the second row of carpal bones and secondarily

to the first row. Therefore, if the posterior radiocarpal ligament be weak, a posterior dislocation of the wrist joint results. However, if this ligament be relatively strong and resistant, the strain during the transmission of force falls upon the weakest part of the relatively immobile os magnum—the neck—and a fracture ensues. That this reasoning is true, is proved by the anatomy of the mid-carpal joint and by the clinical study of the case of Bardenheuer and the one reported by the writer.

*Symptoms.*—The symptoms of fracture of the os magnum may be summarized as follows: An individual who receives a direct injury to the bone, or who strikes the heads of the second, third or fourth metacarpal bones violently enough to produce forcible flexion at the wrist joint, will complain of severe pain over the carpus and inability to use the hand. The pain is diffuse and may radiate to the fingers, following the course of the median nerve; it may be exacerbated locally by deep pressure. Crepitus at a distinct point of the region is of course pathognomic, but may be marked by extensive swelling of the wrist. This swelling, which is the result of extravasation, promptly makes its appearance (see author's case) and is chiefly confined to the dorsum. The maximum point of tenderness is over the os magnum, and from an analysis of the reported cases, this appears to be the most characteristic symptom. If there be an associated dislocation of the head of the bone, a hard protuberance can be detected on the dorsum of the hand. A radiographic examination will serve to confirm the diagnosis.

The *treatment* of simple fractures, uncomplicated by synovitis consists in absolute immobilization of the hand, wrist and forearm, followed by massage. Complicated fractures require antiphlogistic treatment and immobilization until subsidence of the inflammatory symptoms. Articular stiffening and loss of functional power should be treated by active and passive motion, electricity, massage, and hydrotherapy.

## CONCLUSIONS.

1. Fracture of the neck of the os magnum may be caused by direct or indirect violence.

2. The most characteristic symptom is a localized point of exquisite tenderness over the neck of the bone.

3. All severe sprains of the wrist joint should be subjected to X-ray examination.

In conclusion, the author wishes to thank Dr. Adrian V. Lambert, Chief of the Surgical Department, Vanderbilt Clinic, and Dr. Alfred C. Prentice, for the privilege of reporting this case.

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